

WHAT IS CLAIMED IS:

1. A suturing instrument, comprising:
 - (a) a jaw formed with an opening therethrough;
 - (b) a puncturer pivotally mounted from an open position on one side of the jaw to a closed position through said opening on the opposite side of the jaw, said puncturer being constructed to receive a suture in the open position of the puncturer and to move a portion of the suture through said jaw opening to the opposite side of the jaw when actuated to the closed position of the puncturer; and
 - (c) a crochet head for engaging the portion of the suture at said opposite side of the jaw opening and for clamping the suture to the jaw, thereby permitting the puncturer to return to its open position while disengaged from the suture.

2. The instrument according to Claim 1, wherein:

said jaw includes a proximal end and a distal end;

said crochet head is slidably mounted at said opposite side of the jaw and is movable through a forward stroke from a retracted position at the proximal end of the jaw to an extended position at the distal end of the jaw, and through a return stroke back to said retracted position; and

said crochet head has a shaped surface effective to engage the portion of the suture at said opposite side of the jaw during the forward stroke of the crochet head, and to clamp same to the jaw during the return stroke of the crochet head.

3. The instrument according to Claim 2, wherein said puncturer is formed with a hole for receiving said suture.

4. The instrument according to Claim 1, wherein:

said jaw is part of a frame assembly including a proximal section formed with a first handle, and a distal section carrying said jaw; and

said puncturer is part of a puncturer assembly including a proximal section formed with a second handle pivotally mounted with respect to said first handle, a distal section including said pivotally mounted puncturer, and a coupling between said second handle and puncturer for pivoting said puncturer from said open position to said closed position upon pivoting the second handle with respect to the first handle.

5. The instrument according to Claim 4, wherein said crochet head is part of a crochet head assembly including a proximal section formed with a third handle pivotally mounted with respect to said first handle, a distal section carrying said crochet head, and a coupling for moving said crochet head through its forward and return strokes by the pivoting of said third handle with respect to said first handle.

6. The instrument according to Claim 5, wherein said third handle is spring-biased to its retracted position.

7. The instrument according to Claim 5, wherein:

said frame assembly includes an elongated shank between said first handle and said jaw; and

said coupling of the crochet head assembly includes a slide slidable with respect to said elongated shank and carrying said crochet head at the distal end of the slide.

8. The instrument according to Claim 7, wherein;
said coupling of the puncturer assembly includes a rod extending through
said elongated shank of the frame assembly; and
said slide of the crochet head assembly extends along one side of said
elongated shank of the frame assembly.

9. The instrument according to Claim 7, wherein said elongated
shank of the frame assembly includes a U-shaped guide member at the distal
end of the shank adjacent to said jaw and enclosing said slide of the crochet
head assembly for guiding the forward and return movements of the crochet
head.

10. The instrument according to Claim 7, wherein said first handle of
the frame assembly is fixed substantially perpendicularly to said elongated
shank of the frame assembly.

11. The instrument according to Claim 7, wherein said second handle
of the puncturer assembly is pivotally mounted to said first handle of the frame
assembly adjacent to said elongated shank.

12. The instrument according to Claim 7, wherein said jaw of the
frame assembly is formed with two legs parallel to said elongated shank and
spaced from each other to define said space for receiving the puncturer in the
closed position of the puncturer.

13. The instrument according to Claim 7, wherein said puncturer is
pivotally mounted to the elongated shank of the frame assembly adjacent to said
jaw on the proximal side thereof.

14. The instrument according to Claim 7, wherein the face of said jaw facing the puncturer in the open position of the puncturer is formed with a ribbed surface to firmly clamp tissues pierced by the puncturer when the puncturer is pivoted to its closed position through said opening in the jaw.

15. The instrument according to Claim 7, wherein said frame assembly is formed with a slot, and said slide of the crochet head assembly is coupled at its proximal end to said third handle by a pin movable in said slot and engagable with the ends of the slot to limit the forward and return movements of the slide and of the crochet head carried thereby.

16. The instrument according to Claim 1, wherein said crochet head includes a tapered nose at one end for engaging the suture during the forward movement of the crochet head, and a hook formation at the opposite end for receiving the suture and for clamping same to the jaw during the return movement of the crochet head.

17. A method of applying a suture to tissue, comprising the steps of:
- (a) pivotally mounting a puncturer with respect to a jaw having an opening therethrough such that the puncturer is pivotal from a open position on one side of the jaw through said opening in the jaw to a closed position on the opposite side of the jaw;
 - (b) applying a suture to the puncturer when the puncturer is in its open position on one side of the jaw;
 - (c) locating the jaw and the pivotal puncturer on opposite sides of the tissue to be sutured;
 - (d) pivoting the puncturer towards the jaw to pierce said tissue and to pass the puncturer therethrough and through said opening in the jaw to the closed position of the puncturer on the opposite side of

the jaw, and thereby to bring a portion of the suture with the puncturer to the opposite side of the jaw;

- (e) clamping to the jaw the portion of the suture at said opposite side of the jaw; and
- (f) pivoting the puncturer back to its open position while the suture is clamped to the jaw.

18. The method according to Claim 17, wherein the portion of the suture on said opposite side of the jaw is clamped to the jaw by moving a crochet head from a retracted position to an extended position and back to its retracted position after the puncturer has been pivoted to its closed position and before the puncturer is pivoted back to its open position.

19. The method according to Claim 18, wherein said puncturer is formed with a hole for receiving the suture in the open position of the puncturer.

20. The method according to Claim 18, wherein said crochet head includes a tapered nose at one end for engaging the suture during the forward movement of the crochet head, and a hook formation at the opposite end for receiving the suture and for clamping same to the jaw during the return movement of the crochet head.

21. A tissue suturing instrument comprising:

- (a) a tissue grasping mechanism designed and configured for grasping a tissue and for positioning a suture on a first side of said tissue grasped thereby; and
- (b) a crochet head designed and configured for piercing through said tissue from a second side thereof and engaging said suture

following said piercing, thereby enabling drawing of said suture through said tissue.

22. The instrument of claim 21, further comprising a frame assembly including a proximal section formed with a first handle and a distal section carrying said tissue grasping mechanism and said crochet head, said proximal section and said distal section being connected by an elongated shank.

23. The instrument of claim 22, wherein said first handle is disposed substantially perpendicular to said elongated shank.

24. The instrument of claim 21, wherein said tissue grasping mechanism comprises at least two grasping members including a static member disposed rigidly upon said elongated shank and a movable member pivotally movable relative to said static member.

25. The instrument of claim 24, wherein said movable member is pivotally mounted to said static member.

26. The instrument of claim 24, wherein the static member is formed with a face having a ribbed surface for firmly grasping said tissue, said face facing the movable member.

27. The instrument of claim 24, wherein said static member is formed with a guide member disposed thereon for guiding said crochet head.

28. The instrument of claim 27, wherein said movable member is for carrying said suture, whereas a distal end of said movable member is formed with an opening therethrough alignable with said guide member for guiding said

crochet head to engage said suture when said suture is positioned on said first side of said tissue.

29. The instrument of claim 22, wherein said tissue grasping mechanism is part of a tissue grasping assembly including a proximal section formed with a second handle pivotally mounted relative to said first handle, a distal section carrying said static member and said movable member, and a coupling between said second handle and said movable member for pivoting said movable member upon pivoting said second handle.

30. The instrument of claim 29, wherein said coupling includes a rod extending through said elongated shank of the frame assembly.

31. The instrument of claim 22, wherein said crochet head is part of a crochet head assembly including a proximal section formed with a third handle pivotally mounted relative to said first handle, a distal section carrying said crochet head, and a coupling between said third handle and said crochet head for moving said crochet head upon pivoting said third handle.

32. The instrument of claim 31, wherein said coupling includes a slide slidable with respect to said elongated shank of the frame assembly, said slide being aligned with said guide member.

33. The instrument of claim 32, wherein said crochet head is slidably mounted in proximity to said tissue grasping mechanism and is movable through a forward stroke from a retracted position at a proximal end of the tissue grasping mechanism to an extended position beyond a distal end of said tissue grasping mechanism, and through a return stroke back to said retracted position; said crochet head having a point for piercing the tissue during the forward

stroke, a shaped surface for engaging the suture, and a hook formation for drawing said suture through said tissue during the return stroke.

34. The instrument of claim 33, wherein said third handle is spring-biased to said retracted position.

Patent 2,346,600